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Every picture tells a story: 'The Archaeology Disc' and its implications

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3.1 Introduction

A two and a half year project in the Archaeology Department at Leicester University on the use of videodiscs in archaeology is now finished. This paper presents the conclusions of the project, and discusses its implications for teaching archaeology, and for archaeological recording methods.

The project was one of over 130 funded by the University Grants Committee (the predecessor of the Universities Funding Council) and the Computer Board for Research in Universities. The primary aim was to investigate and develop the use of new technology in undergraduate teaching. The background to the national Computers in Teaching Initiative (CTI) and details of the wide range of projects supported by it can be found in the various issues of its publication The CTISS File. As is often the case, the budget for the Leicester videodisc project was a compromise betwen what was actually needed, and the level of funding which was on offer.

The project at Leicester University was inspired not only by the potential of videodiscs for teaching, but also by a wider interest in the use of this technology for recording the visual and graphical information which forms such an important part of archaeological records at all levels (Martlew 1988). Awareness was already being raised by demonstrations of videodiscs such as the BBC Domesday discs, but there was a limit to the level of understanding which professional archaeologists could gain by trying to retrieve often strange information about their home town from the Domesday Community Disc. It was felt that a videodisc containing specifically archaeological material was needed, both to investigate its potential as a recording technology and to develop innovatory applications for undergraduate teaching.

3.1.1 Compiling material for the videodisc

The videodisc produced by the project became known as "The Archaeology Disc", and was designed from the start as a resource disc. Since it is currently not possible to change the contents of a laservision disc once it has been pressed, it was not thought advisable to enshrine any particular theories or interpretations on the disc. The next excavation or fieldwork project could easily overturn such theories and leave the disc as a museum exhibit itself, rather than as a tool of continuing value.

The main subject for The Archaeology Disc was British stone circles, with some material on related sites. This provided a reasonably well defined core of field monuments, presenting a range of morphological characteristics and a wide geographical spread. Stone circles also support an interesting variety of theoretical interpretations, such as astronomical alignments and geometrical construction, which often present difficult material for undergraduates to assimilate.

A visual record of such sites is important not only for showing the nature of site itself, but also its setting in the landscape. The contrasts between sites such as Stonehenge and Castlerigg, or Balnuaran of Clavaand and the Hurlers can be seen instantly on the screen, without any need for lengthy textual descriptions. Given the limitations of the budget it was to our advantage that finds from stone circles are relatively few.

Stone circles represent an excellent example of the rapid fall off in the availability of visual information once the 'classic sites' have been covered in, for example, general textbooks on prehistory. The cost of publishing visual information by traditional means has obvious consequences: in seven general books on prehistory (one relating to Europe, one specifically to Scotland and the rest to Britain), Stonehenge receives most coverage in the form of halftone plates. The 12 pictures are mostly black and white, with notable exceptions in a particularly glossy production (Clarke *et al* 1985). A limited range of other sites appears less regularly: Avebury (8), the Ring of Brodgar and Callanish (6), Loanhead of Daviot (4), and Castlerigg and the Stones of Stenness (3). Four other sites are shown in one plate each, spread between three books. The main specialist book on this subject (Burl 1976) contains 36 black and white plates. Students can expect to see other visual information on stone circles in their lectures, perhaps including unpublished material, but this is not information to which they have easy access (Martlew 1990).

In contrast, an attempt was made on The Archaeology Disc to show at least one picture of every known stone circle, even if the site consisted of widely spaced, low stones set among tall heather. Over 2,500 still pictures are supplemented by a full motion video, and almost all of the images are in full colour. This is not to say that printed textbooks should be full of pictures, or should try to present a comprehensive visual catalogue. Each medium has a different rôle to perform, and has different strengths and weaknesses. The point of the comparison is to show the extent to which traditional printed media have failed to disseminate visual information, and that an extremely efficient medium is now available to do the job.

Most of the material for the stone circle image databank on The Archaeology Disc came from the personal collections of academics and private individuals. The budget permitted only a limited amount of new material to be gathered, and this was aimed specifically at demonstrating innovations made possible by the technology. We are particularly grateful to Dr. Aubrey Burl who allowed us complete access to his extensive archive, and to others such as John Barnatt and Alison Haggarty who allowed us to use material in advance of publication. Most of the material consisted

of 35mm colour slides, but plans were also included as drawings, many of them being re-drawn in colour to make full use of the medium.

One particular strength of videodisc technology is its capacity for combining still pictures, moving images and sound. Archaeological material is not noticeably mobile or noisy, but there are ways in which the techniques of television can supplement the information about artefacts or sites recorded conventionally by still photography or drawing. Videodiscs, however, offer better access to the images than linear video or film, and it was important to locate relevant material for The Archaeology Disc which would allow us to investigate the implications of this for archaeological recording. With the generous cooperation of Palladium International PLC it was possible to include material on stone circles from a television programme made by Simon Welfare for Yorkshire Television. This includes rare (and genuine) footage of the winter solsticial sunrise as seen from inside Newgrange tomb in Ireland, a powerful way of introducing the subject of archaeoastronomy to undergraduates. Since there is full control of the audio channels on the disc, the commentary, which is aimed at a lay audience, can be turned off. There is useful teaching material even here, however, with current interest in the public presentation of archaeological sites and monuments.

Even with this moving video, only about half of one side of The Archaeology Disc was used, so spare space was sold to anyone who wanted to try out the technology for a share of the production costs. Some of this material has no connection with archaeology, such as that from the Institute of Irrigation Studies at Southampton University and the Royal United Hospital in Bath. With complete computer control over access to different parts of the disc, this subdivision represents efficient use of the resource and need not be apparent to the user. Several archaeological bodies also took the opportunity to test the technology with their own material, including the Royal Commission on the Historical Monuments of England, the National Monuments Record of Scotland and the York Archaeological Trust (Maytom, this volume).

The transfer of slides, photographs and drawings to videotape was carried out by Ken Morse Rostrum Cameras, and the quality of the images on the disc has been admired by other videodisc producers. Final editing of the master tape was carried out by Sheffield University Television, and a master disc was produced by Philips at their plant in Blackburn. Thirty copies of the disc were pressed, the distribution and use of which are strictly limited by agreement with the owners of copyright material on the disc. The Archaeology Disc is intended purely for research and evaluation purposes, and copies have been distributed at a notional cost to cover pressing and replication charges.

The intention of the Computers in Teaching Initiative was to encourage and develop the use of new technology in Higher Education. Most of the interest shown in The Archaeology Disc, however, came not from this sector but from, or on behalf of, the secondary sector. Discs have been sold to education resource centres and departments of education from Grampian to Exeter for evaluation and trials, but only two copies have actually been acquired by a university department of archaeology. The possible reasons for this, and its implications, are discussed in the next section.

3.2 Interactive videodiscs in archaeology teaching

The pedagogical background to the Leicester videodisc project has been discussed elsewhere (Martlew 1989, Martlew 1990). Other more general treatments of this aspect can be found in, for example, Barker 1989. The main points to be covered here concern practical issues of developing courseware associated specifically with The Archaeology Disc, and the identification of problems and productive lines of development for the future.

Although careful attention has been paid to the effectiveness of interactive videodiscs in a training environment, research into their use in more general education is spread thinly among a wide range of specific applications covering different agegroups (Whiting 1989, p. 45; Mashiter 1989, p. 205). Videodisc projects are still very much at the leading edge of developments in university teaching, but the initiative should now be moving from proselytising to implementing videodisc applications (Clark 1989). The CTI, as a "pump-priming" exercise, has supported the initial creation of evangelists, and the CTI subject centres are now helping them spread their message. There is, however, little real support for the process which matters most: the production of materials which can be picked up and used straight away by university teachers and students around the country. This failure can only hold back the use of new technology in teaching.

The current climate in Higher Education, with student numbers increasing while staff numbers and resources remain much the same, introduces a very real danger that new technology of any form will be seen as a cheap alternative to employing additional staff. The aim of the Leicester videodisc project was not to develop technology to replace human teachers, but to provide an additional tool to broaden the current learning environment for undergraduates. No single approach to teaching and learning can ever be expected to satsify all of the 'consumers' all of the time. An understanding of the processes of learning will enable effective strategies to be identified for particular individuals, and a good teacher will ensure that students can choose their strategy from a range of learning activities. Whiting, for example, found that small groups of students collaborated on a computer assisted learning (CAL) tutorial at a single terminal. There was interaction between the members of these groups which added more to the activity than would have arisen from a single user working at a computer. 'Holists' in the groups grasped the broad aims of the tutorial, and explained them to other members of the group who could be defined as 'serialists' (Pask 1976, p. 130). The serialists in return encouraged the holists to look at the work in greater detail. One of Whiting's conclusions is worth quoting in full:

> "careful design of such learning experiences can promote the autonomy of learners and simultaneously free the teacher to act in ways which encourage the development of their students' cognitive abilities, rather than rote learning and remembrance of facts." (Whiting 1989, p. 49).

The Archaeology Disc is an attempt to provide support for teachers in the management of their students' learning activities. Visual information is central to the teaching of archaeology, and students' access to such information is currently restricted and outside their control (Martlew 1990).

3.2.1 A cautionary tale of software (non) development

Unfortunately, authoring software for the development of 'courseware' (packaged programs for use by students) only became available for the chosen hardware configuration as the project drew to a close. The criteria which had been applied in looking for hardware and software were portability and cheapness, on the grounds that it was the aim of the CTI to reach the widest possible audience. The hardware selected for the project was the Research Machines Nimbus PC, for which, in the early days, the necessary interface was being developed in response to the BBC Domesday videodisc project. This hardware was chosen in preferance to the BBC micro because of the greater potential and portability of MSDOS 16 bit software. IV authoring software running under MSDOS appeared to be forthcoming at the start of the project, but the people responsible for this work at Research Machines left to set up their own company, with different research and development priorities. Two years later a preproduction version of the software has been given to the project for betatesting, at the same time that a different company finally produced an MSDOS version of their BBC authoring package. The incomplete nature of the prototype software, and the late arrival of its alternative, will not support a serious evaluation of learning strategies using the videodisc within the original terms of the project.

It has been said that "every single interactive video project ever undertaken is always in need of just a little more..." (Clark 1988, p. 43) and the Leicester videodisc project (for reasons outside our control) has maintained this tradition. In fact this would probably have been true even if the software had been available on time, since the resource which has been created could sustain the development of curriculum based teaching materials for at least the time of the project over again. Providing relatively simple interactive access to the 44 images of the sheep skeleton, for example (albeit with poorly documented and incomplete software), took about a week of concentrated effort. The work consisted mainly of the fairly mundane tasks of designing graphic overlays, and making sure that the various links from one frame to another operated correctly: actually designing the overall scheme took relatively little time.

3.2.2 Computers in Teaching: the lack of initiative

It is this low level, labour intensive work which is retarding the development of computers as teaching aids, in archaeology or in any other subject. Such work does not contribute to an academic's list of publications, and so will not be counted by the Universities Funding Council when it carries out its superficial yet influential assessment of the worth of university departments. The lack of institutional infrastructures to support the development of undergraduate teaching methods has been discussed elsewhere (Martlew 1990, p. 467). It is sufficient to report here that the presence at Leicester of two 'research projects' on the use of new technology in teaching has had as little institutional impact as any other research project in the university: courted while they were 'sexy' (to use the jargon of the eighties), they are now, in old age, quietly forgotten. Responses have varied from institution to institution, and from subject to subject. Archaeology has an advantage in that the use of computers by the profession will ensure them a place in the undergraduate curriculum. This is also, however, a disadvantage, in that it compromises the aim of the CTI to develop computers as tools for teaching and learning. This aim will have been met, for example, when students use computers to learn about Neolithic ritual monuments in a prehistory course, rather than databases or wordprocessing in a computing course (even if archaeological examples are used (Dobson 1989, p. 19)).

3.2.3 The future for videodiscs in archaeology teaching

Videodiscs are likely to be used in teaching archaeology in the future, but mainly because of their use in institutions outside the education system rather than any pedagogically led developments in universities. Museums, government agencies and others connected with professional archaeology, tourism and the 'heritage industry' will be using videodiscs for their own archival and educational purposes, and these resources may filter into mainstream education.

Any use of videodiscs, however, should not be seen in isolation. They will occupy a particular niche, performing the tasks to which they are best suited, alongside other technologies fulfilling different needs in a multimedia environment. "Our business is knowledge creation and the communication of that knowledge. Success as a university requires freedom to interact with knowledge and information sources wherever they are" (Jordan 1989, p. 33). One of the hardware implications of this need is the growing demand for broadband campus networks, so that facilities other than data communications can be made available. Aston University is installing a system which consists not only of two Ethernet channels carrying data at up to two megabits per second, but also includes eight oneway video channels and four twoway video channels. 2500 service points will be installed on the campus, the Science Park and in student residences (ibid). The inclusion of visual information in the services provided by such a network is a major area for development.

This level of provision is obviously capital intensive, and requires careful justification before launching into expenditure on the scale of the £4 million being spent by Aston University. Videodisc projects associated primarily with teaching, rather than research, will find such justification extremeley difficult in the university environment. However, the slow takeup of videodiscs, relying on developments outside the education system, may not be the worst of all possible evils. If university administrators decide that videodiscs and other computer related technologies are a way of increasing 'productivity', enabling the same number of staff to teach ever larger numbers of students, the right development may find itself being pushed along for the wrong reasons. It is hoped that the experience of the Leicester videodisc project will provide further ammunition for the educationalists against such cynical exploitation of new technology in teaching.

3.3 Optical discs for image archives in archaeology

The second major aim of the Leicester project was to investigate the use of videodiscs for storing image archives. The need for improved storage and retrieval systems for image data in archaeology is not hard to define. Videodiscs offer tremendous potential for applications ranging from the tens of thousands of excavation slides held by an urban unit (Maytom, this volume), to the millions of slides, prints and artwork held in national collections such as the picture library of the Royal Commission on the Historical Monuments of England (RCHME). The inclusion of a range of material from the York Archaeological Trust, the RCHME and the National Monuments Record of Scotland on The Archaeology Disc enabled the staff of the various institutions to see their own familiar images as portrayed by video. This resulted in a useful definition of the best role for interactive video in an archival context, and the identification of the limitations of this particular medium.

3.3.1 Visual catalogues

Videodiscs are already in use in some museums (most notably the Prins Henrik Maritime Museum in the Netherlands) as visual catalogues which can be searched by visiting scholars and members of the public. The videodisc serves as a quick and easy way of making a 'first pass' through the available information. Instead of just getting a printout listing the photographs or artefacts in a collection which match the user's requirements, the user can actually browse through the pictures or see the artefacts straight away. This is particularly useful for archaeologists when trying to locate, for example, the best selection of aerial photographs of a group of cropmark sites. As with text retrieval, locating the information by standard query on site name or location is relatively easy without a computer, since that approach is anticipated by the archive's manual cataloguing system. The real advantages arise when the power of the computer to search on a number of different cataloguing fields simultaneously is combined with the almost instant retrieval of the image itself, not just its storage location

This, however, is about as far as videodisc technology currently goes. One significant factor counts against a videodisc becoming the final archive for visual information, and that is the problem of resolution. Analogue video screens contain 625 lines vertically in PAL format, with 768 square pixels on each line. At a distance of more than six times the height of the picture, the human eye cannot detect the difference between the lines (Clark 1987, p. 61). It is common for users of videodiscs, however, to be sitting closer to the screen than this in order to interact with the image via mouse, keyboard or touchscreen. For the serious, in-depth study of images such as aerial photographs, finely decorated artefacts or detailed drawings, analogue video does not yet provide a solution for the professional. It is arguable, however, that at this level of study there will never be any substitute for the real thing, and that what is important is that users can select relevant original material quickly and with maximum flexibility.

3.3.2 Heritage documentation

Videodiscs are being used in a number of projects to record standing buildings, works of art and other artefacts which come under the general heading of 'cultural heritage'. A recent report identified 16 'cultural catalogues' on videodisc in use in museums and libraries throughout the European Community (Commission of the European Communities 1988, p. 259). A major project began in Italy in 1986, with the government spending 600 billion Lire on combined text and image databanks to record the country's cultural heritage. 16 out of 19 project examined for the DOCMIX report are based on optical disc technology, with titles ranging from *La presenza ebraica in Italia* (an image databank of ancient Jewish artefacts on videodisc) to *Torri e complessi fortificati di Roma medioevale* (towers and fortifications of medieval Rome). Another project, *Verso Genova Medieval*, allows surrogate travel through medieval Genoa using analogue images on videodisc and computer generated graphics (ibid, 244).

The SIRIS project *(Sistema Informativo per la Ricostruzione dell'Insediamento Storico)* aims to create an integrated text, cartographic and image databank of historical settlements in the region of Emilia-Romagna. What is in effect a multimedia geographical information system consists of a microVAX running INFORMIX under XWindows, and controlling a videodisc player which displays images on a separate monitor. The project cost over a billion Lire, and employed 96 people for two years (SIRIS 1989).

In France, 22 regional centres have been set up to make heritage documentation more accessible to the public. The level of documentation varies from region to region, but there is generally a heavy reliance on microfilm. At least one region, Languedoc, is developing a videodisc application, in this case on medieval stainedglass windows (Centlivre *et al* 1989).

In Denmark, videodiscs are being used to display 2,000 background maps on which the distribution of prehistoric sites and monuments can be plotted using overlaid computer graphics. A project at the National Museum in Copenhagen has stored 105,000 pictures of artefacts from the museum's

collection on videodisc, for use by visitors to the museum (Larsen 1989).

The brief descriptions of these projects is not intended to be an exhaustive survey of archival videodisc applications in Europe, but is rather to show the scale at which videodisc technology comes into its own. The sheer volume of material which can be stored on a videodisc can in itself be a disincentive, both to potential developers and to funding agencies. The transfer of images to videodisc is labour intensive, and therefore expensive, but it comes nowhere near the labour and costs involved in cataloguing the images, and in developing support materials in the form of a userfriendly interface and documentation.

3.3.3 The future for videodisc archives

The main consideration for the future development of videodisc applications is the dichotomy between current specifications of optical media. The potential rewards are great: a computer controlled delivery system which has sufficient image quality to replace photographic archives completely. On the analogue side, the laservision format for videodiscs may be superceded by the development of high definition television, while the digital side the Compact Disc (CD) format appears to have inspired the War of the Acronyms: CDI and DVI are fighting for a commercial foothold, and in the meantime CDXA offers a partial stage in the development of a single medium for mixed digital video, audio and data. Confusion over hardware standards, interfacing and software standards is adding to the inevitable claims and counterclaims in an industry which is still very young, as rival manufacturers battle for potentially lucrative markets. Quoting the editor of The Videodisc Monitor, Frenkel points out that there is still "a long way to go before digital formats are anywhere near as cost effective or data dense for full motion video and large databases" as analogue videodiscs (Frenkel 1989, p. 875). In the meantime, there are many important issues about the indexing of image databanks, and userfriendly interaction with them, which must be explored. Current technology is perfectly adequate for investigating these issues, and it would be shortsighted to defer this work in the expectation of technological changes some time over the next 10 years. Now that we have a videodisc containing relevant material, some of these problems can be tackled in the field of archaeology.

If future work with optical discs of either analogue or digital format is led by the technology, laservision videodiscs will remain in a relatively small, specialised niche serving large scale stills archives, and commercial training needs which require full screen, full motion video. If, however, future work is applications led, videodiscs will form a significant part of a multimedia environment alongside smaller scale archives on CD (such as bibliographic and excavation archives), and ad hoc collections of mixed text and graphics on CD ROM discs. The Leicester videodisc project has shown that producing the discs is relatively straightforward, while developing the friendly and powerful interface which the users of such technology require is a much greater task. Work in this area can usefully proceed while the hardware manufacturers fight over the nuts and bolts of future delivery systems: it is, after all, the message which is important, not the medium.

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